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IS : 7329 - 1974

Indian Standard
SPECIFICATION FOR
METAL LASTS FOR SAFETY RUBBER-CANVAS
ANKLE BOOTS

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SPECIFICATION FOR METAL LASTS FOR SAFETY RUBBER-CANVAS ANKLE BOOTS

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Indian Standard

SPECIFICATION FOR METAL LASTS FOR SAFETY RUBBER-CANVAS ANKLE BOOTS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 31 March 1974, after the draft finalized by the Footwear Sectional Committee had been approved by the Chemical Division Council.

0.2 The requirements prescribed in this standard for the metal lasts are based on the lasts known in the trade as lasts No. 41008 used in the manufacture of jungle fighting boots for Defence Services. The lasts covered in this standard have a size interval of 10 mm, which differs from that recommended in IS: 1638-1969* since the shoe industry will progressively switch over to centimetre scale sizes or any other system of rational metric sizes. To avoid any hindrance in the utilization of present equipment and lasts in conventional (British) size scale, both metric and British (8.5 mm) size intervals are covered for the time being.

0.3 Although for better fitting and foot health half-sizes with multiple fittings would have been ideal, the Sectional Committee decided to cover for the time being only full sizes with one fitting, namely, $G\frac{1}{2}$, in view of enormous capital expenditure on equipment and tools.

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS: 2-1960†. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard specifies requirements and methods of sampling and test for metal lasts used in the manufacture of safety rubber-canvas ankle boots.

*Sizes and fittings of footwear (*first revision*).

†Rules for rounding off numerical values (*revised*).

2. TERMINOLOGY

2.1 For the purpose of this standard, the definitions given in IS : 2050-1967* shall apply.

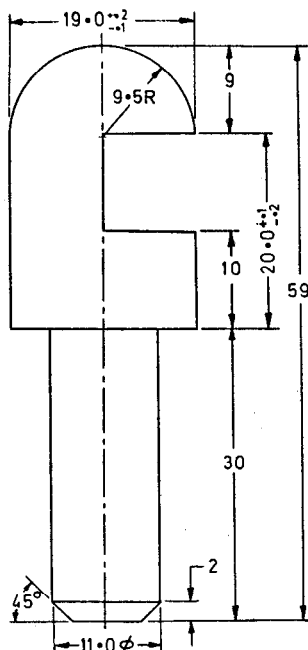
3. REQUIREMENTS

3.1 Material — A suitable aluminium alloy (*see* Note) shall be used for the manufacture of the lasts.

NOTE — Aluminium alloy ingots conforming to Designation A-4 of IS : 617-1959† may be used for the purpose.

3.1.1 Metal Pins — The metal pins (*see* Note) shall be made of mild steel and shall be as shown in Fig. 1.

NOTE — The pins are fitted on the top of the lasts meant for use in big organized industry where vulcanizing racks and semi-automatic or automatic conveyors, fitted with holders to hold the lasts by the pins during the mechanized manufacturing process, are employed.



All dimensions in millimetres.

FIG. 1 METAL PIN

*Glossary of footwear terms.

†Specification for aluminium and aluminium alloy ingots and castings for general engineering purposes (*revised*).

3.2 Construction and Finish

3.2.1 The lasts shall be hollow-cast by sand casting, diecasting or centrifugal casting.

3.2.1.1 The lasts shall be free from blowholes, depressions, casting marks and other surface defects. Tiny blowholes may, however, be permissible

3.2.2 The pins for the lasts shall be one-piece.

3.2.3 The pins may be inserted either while casting or afterwards with the help of oil. If the pins are to be inserted afterwards, the diameter and depth of the holes for the pins shall correspond to the outside diameter and length of the stems of the pins, so that the pins, when inserted, are tight in the holes and their heads touch the top of the lasts uniformly. The pins, if inserted afterwards, shall be riveted to the last with a mild steel wire of 3 mm diameter as shown at A in Fig. 2.

3.2.3.1 The clip slot in the head of the pin shall face backwards as shown in Fig. 2. The ends of the riveting wire shall be finished flush with the last surface.

3.2.4 The lasts shall be evenly and accurately secured (ground) first by 60-grit and finally by 100-grit abrasive (*see* IS : 715-1966*). The surface shall be absolutely smooth and polished (glazed) for easy unlasting of boots after vulcanization. The lasts of identical sizes and fittings shall conjugate, that is, the right last shall, in respect of form, serve as mirror image of the left one.

3.2.5 The pin and the top of the last shall be painted with quick drying aluminium paint (*see* IS : 2339-1963†) which shall withstand vulcanizing temperature up to 150°C for 1 hour.

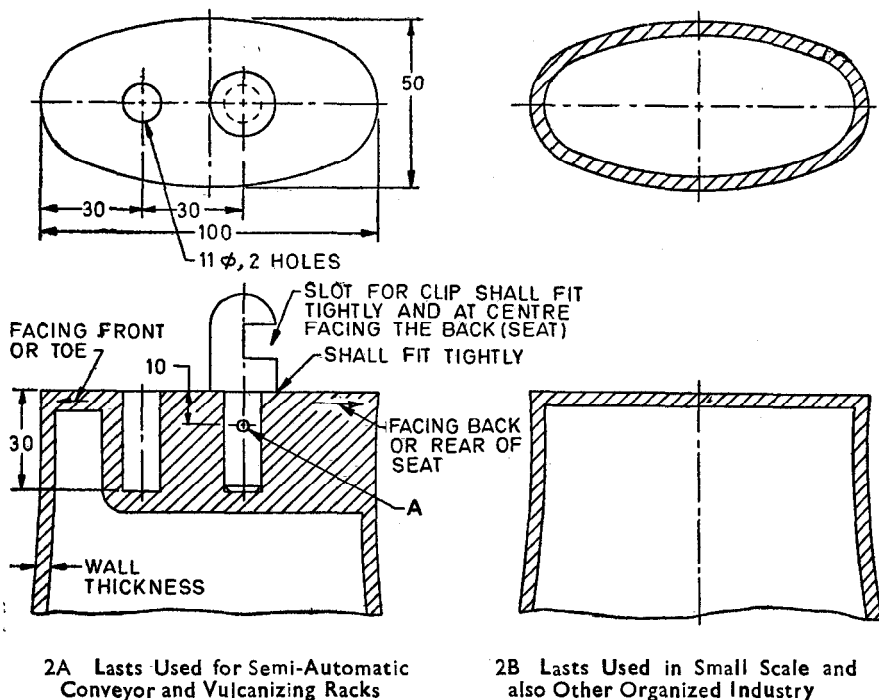
3.3 Pin-Points and Quarter Height Mark

3.3.1 Pin-Points — On all lasts, pin-points shall be marked with the help of a pointer for checking their dimensions. These pin-points shall be located as follows (*see also* Fig. 4):

- a) In the forepart of each last, 3 pin-points shall be put, the first at the inside joint, the second at the outside joint and the third at the base of the instep (along the centre line of the last) for measuring the girth of joints.
- b) One pin-point shall be put on the instep of each last for measuring the instep girth.

*Specification for coated abrasives, glue bond (*second revision*).

†Specification for aluminium paint for general purposes, in dual container.

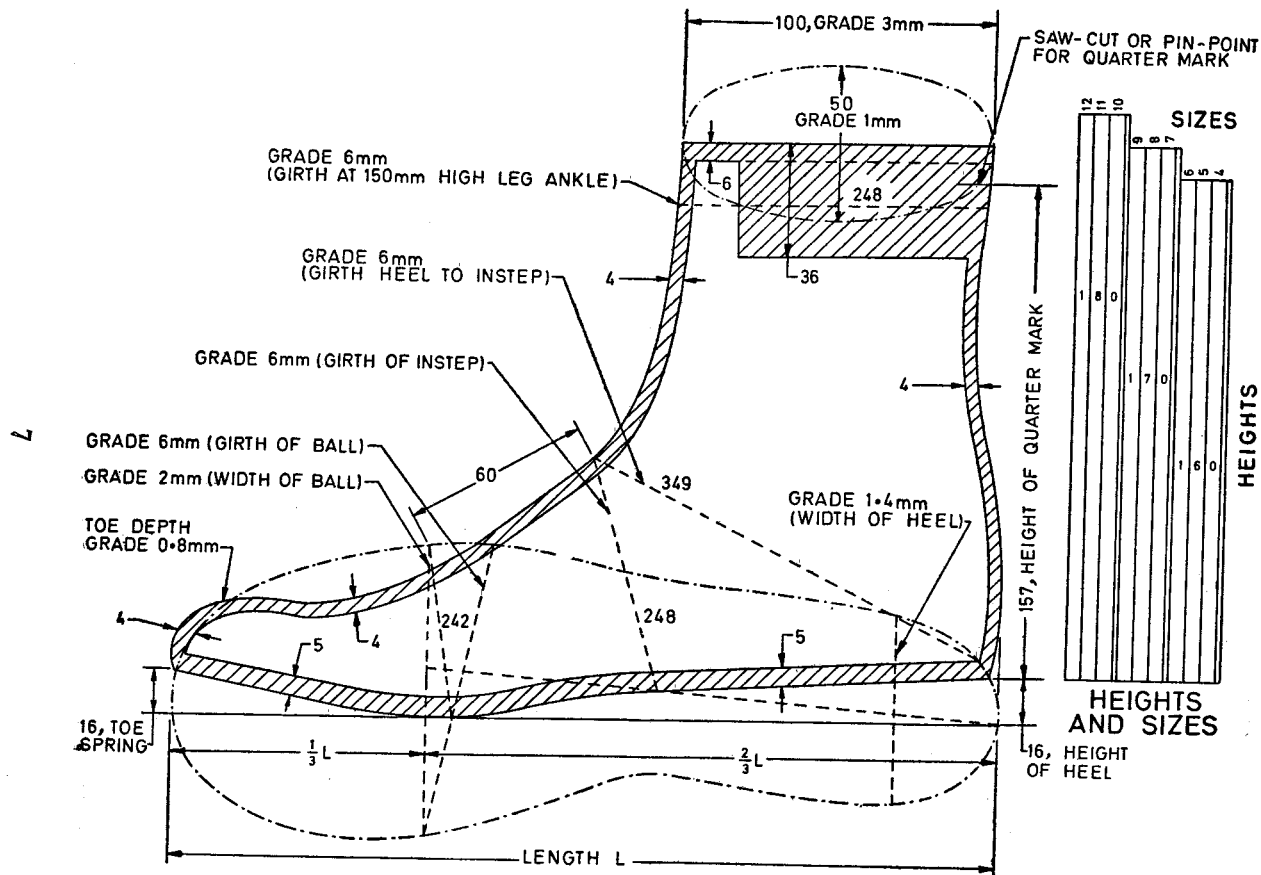


All dimensions in millimetres.

FIG. 2 SECTION OF LAST

3.3.2 Quarter Height Mark — In order to have a uniform and accurate quarter height in the finished boots and to minimize the effort in the manufacturing process, the quarter height, as given in col 16 of Table 1 and Fig. 7, shall be marked on each last along the centre line of the heel curve by putting a pin-point or a saw-cut.

3.4 Insole Design — The insole of size 7 or 270 mm medium fitting grade (G) last shall be as given in Fig. 3 and 5. The insoles for other sizes shall be as indicated in Fig. 6. The details of the points, lines, dimensions and angles relating to the construction of insole are given in Appendix A.



All dimensions in millimetres.
 FIG. 3 DIMENSIONS OF METAL LASTS (SIZE 7 LAST)

3.5 Dimensions

3.5.1 The measurements of the lasts in respect of size and fitting shall be as given in Table 1, and Fig. 3 and 7.

3.5.1.1 Permissible deviations — A tolerance of ± 0.5 mm shall be allowed on all dimensions except insole feather edge and bottom shape area. In the case of insole feather edge and bottom shape area a tolerance as agreed to between the purchaser and the supplier, subject to a maximum of ± 0.3 mm, shall be allowed all round.

3.5.2 For all sizes, the height of the heel and toe spring shall be 16 mm (see Fig. 3).

3.5.3 Wall Thickness — The wall thickness of different portions of the lasts shall be as follows (see also Fig. 2 and 3):

Portion	Wall Thickness mm
Dorsal	5.0 ± 0.5
Planter	4.0 ± 0.5
Comb top:	
a) For pin attachment system	36.0 ± 1.0
b) For other process	6.0 ± 0.5

3.5.4 Dimensions of Metal Pins — The dimensions of the metal pins shall be as shown in Fig. 1.

4. MARKING

4.1 Each last shall be clearly marked with the following on the outer side of its heel portion:

- Size of the last,
- Designation of fitting, and
- Name or trade-mark of the manufacturer.

4.1.1 On every box, trade-mark, number of pairs of lasts according to each style, size, fitting number, and weight shall be marked.

4.1.2 The lasts may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys

the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

5. PACKING

5.1 The lasts shall be packed in wooden cases conforming to IS : 1503-1967*.

5.1.1 The case shall be lined with waterproof packing paper conforming to IS : 1398-1968† along its bottom and sides. A layer of shavings or straw shall then be spread on the paper at the bottom of the case and a suitable number of lasts placed in rows. The space between individual lasts and between the lasts and the sides of the case shall be filled closely with paper cuttings conforming to IS : 4356-1967‡, wood shavings or straw. On the lasts so arranged, a layer of wood shavings, straw or paper cuttings shall be spread. In this way layers of lasts shall be packed till the box is filled. The top of layer shall also be covered with straw, wood shavings or paper cuttings and the packing paper.

5.1.2 The lid shall be securely nailed to the case, the nails being directly driven in.

5.1.3 The cases shall be secured against breakage in transit by binding with hoop iron or other suitable hooping material.

6. SAMPLING AND CRITERIA FOR CONFORMITY

6.1 For the purpose of ascertaining the conformity of the lasts to this specification, the scale of sampling and the criteria for conformity shall be as given in Appendix B.

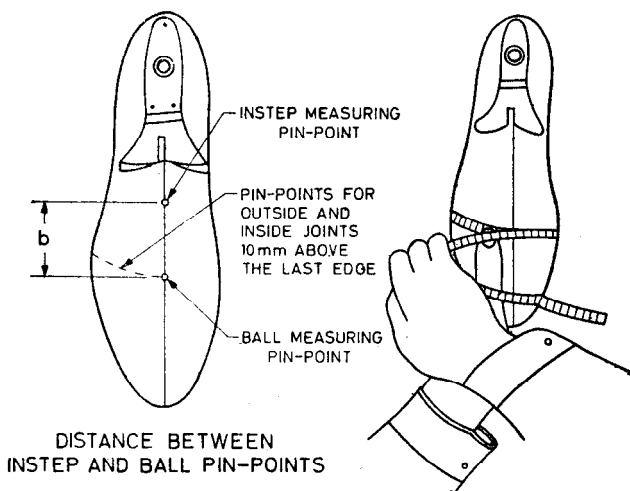
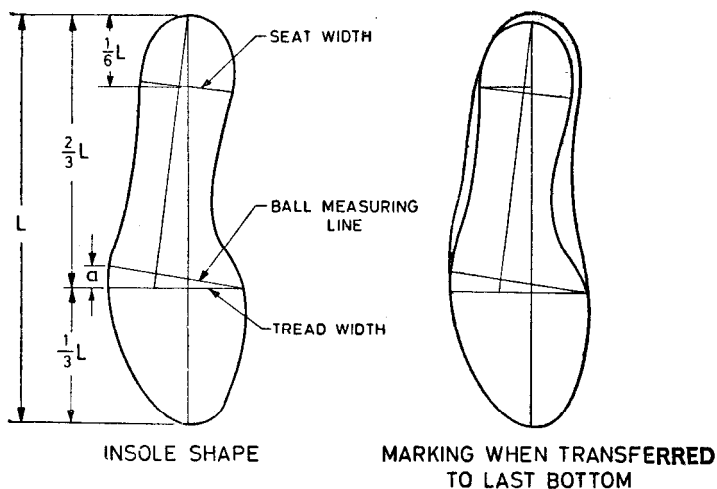
7. TEST METHODS

7.1 Visual Characteristics — Examine the lasts visually for conformity with the approved specimen in respect of finish, appearance, surface defects, etc.

*Specification for wooden packing cases (*first revision*).

†Specification for packing paper, waterproof, bitumen-laminated (*first revision*).

‡Specification for paper cuttings.



a = maximum distance between ball measuring line and tread width = 20 mm
 b = distance between instep and ball pin-points = 60 mm
 L = standard length of insole

FIG. 4 LOCATION OF GIRTH MEASURING POINTS

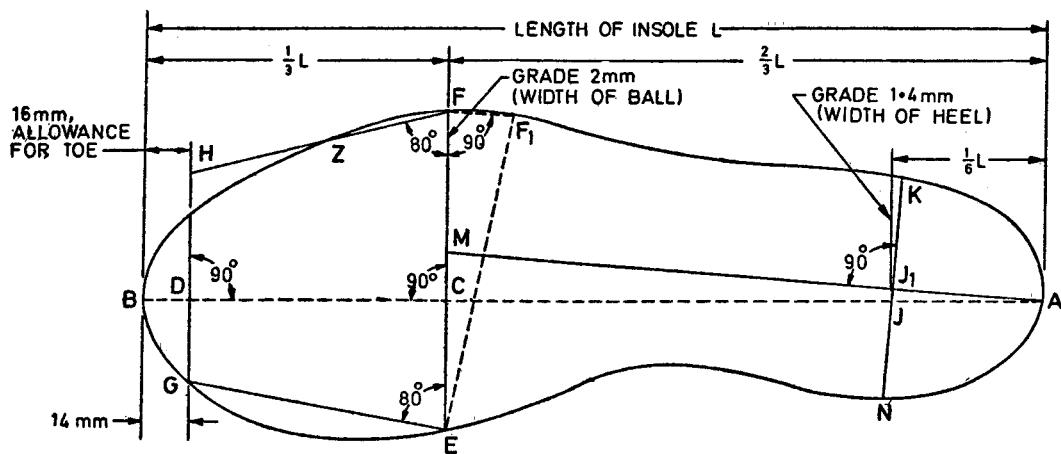


FIG. 5 INSOLE CONSTRUCTION (SIZE 7 LAST)

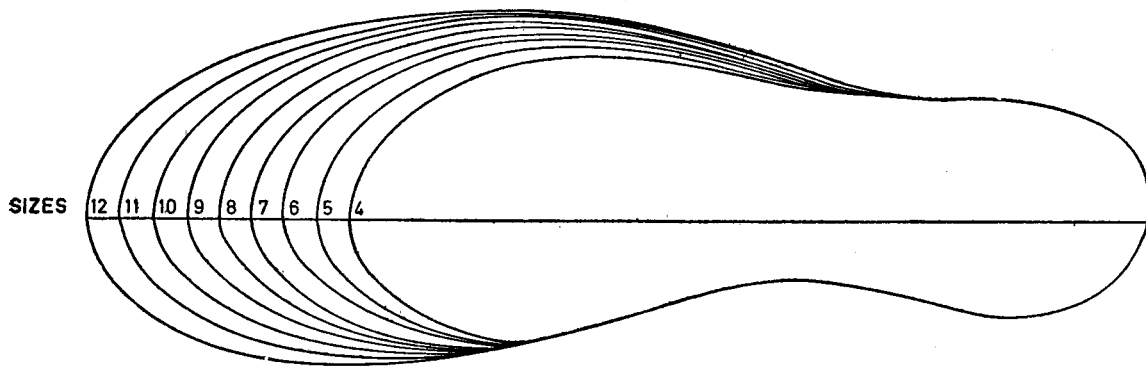


FIG. 6 INSOLE GRADING

TABLE 1 DIMENSIONS OF LAST

(Clause 3.5.1, and Fig. 3 and 7)

All dimensions in millimetres.

Sl. No.	FOOT LENGTH IN SIZE-STICK	FOOT LENGTH IN SIZE	CONVENTIONAL (BRITISH) SHOE SIZE	LENGTH OF LAST IN SIZE-STICK	LENGTH OF INSOLE OF LAST	FITTING	WIDTH OF BALL OR TREAD WIDTH	WIDTH OF HEEL	GIRTH OF BALL	GIRTH OF INSTEP	GIRTH HEEL TO INSTEP	GIRTH OF LEG AT 150 mm ANKLE	TOE DEPTH	HEIGHT OF LAST	HEIGHT OF QUARTER MARK
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
i)	226 to 233	2	4	238	240	$G\frac{1}{2}$	89	59.8	224	230	331	230	23.6	160	148
ii)	234 to 244	3	5	248	250	$G\frac{1}{2}$	89	61.2	230	236	337	236	24.4	160	151
iii)	245 to 252	4	6	258	260	$G\frac{1}{2}$	91	62.6	236	242	343	242	25.2	160	154
iv)	253 to 260	5	7	268	270	$G\frac{1}{2}$	93	64.0	242	248	349	248	26.0	170	157
v)	261 to 268	6	8	278	280	$G\frac{1}{2}$	95	65.4	248	254	355	254	26.8	170	160
vi)	269 to 276	7	9	288	290	$G\frac{1}{2}$	97	66.8	254	260	361	260	27.6	170	163
vii)	277 to 284	8	10	298	300	$G\frac{1}{2}$	99	68.2	260	266	367	266	28.4	180	166
viii)	285 to 292	9	11	308	310	$G\frac{1}{2}$	101	69.6	266	272	373	272	29.2	180	169
ix)	293 to 300	10	12	318	320	$G\frac{1}{2}$	103	71.0	272	278	379	278	30.0	180	172

7.2 Dimensional Characteristics

7.2.1 Measure the length of the lasts with the corresponding size-stick; the proportions for the contiguous sizes are based on the given standard length (*see* Table 1, and Fig. 3).

7.2.2 To ensure that the longitudinal and transverse sections, ball and heel parts and bottom shape of a size of last agree with the relevant specified requirements for shape and dimensions, use the corresponding insole pattern and control profiles including back curve of the heel and toe and bottom profiles (*see* Note, and Fig. 5).

NOTE — The insole pattern and control profiles shall be cut to the master or approved size, from which remaining sizes shall be graded. It gives length, shape of the lasts and width of the forepart and of the seat. Grades are arbitrarily fixed and adopted by custom in last industry.

7.2.2.1 On superimposition, the profile pattern of the longitudinal bottom section (generally called ' bottom profile ') shall coincide with the bottom of the last along with the contour of the heel back curve.

7.2.2.2 On superimposition, the profile pattern of the longitudinal toe section (generally called ' toe profile ') shall coincide with the longitudinal axis of the body of the last in its upper forepart.

7.2.3 Take other measurements of the lasts with a suitable last-measuring tape (a steel tape or a tape of non-variable dimensions with a fine wire interwoven in it) of width not more than 10 mm.

7.2.3.1 While measuring the joint, instep, ankle and leg at 157 mm height, lay the measuring tape on the last in such a way that the measuring edge of the tape fits closely and lies flat on the last along the line of measurement.

7.2.3.2 While measuring the instep girth of the lasts, keep the measuring edge of the tape in contact with the marked points taking care that the tape settles in the most concave part of the bottom of the last in such a manner as to give the minimum measurement.

7.2.3.3 While measuring the girth of the ankle, the tape shall be placed round the heel seat and the ankle as shown in Fig. 4.

7.2.3.4 While measuring the girth of the legs the tape shall be placed parallel to the top line as shown in Fig. 4.

7.2.3.5 Check the height of the last with callipers.

7.2.3.6 Check the dimensions of the pins of the lasts with callipers and with a holder in which the pins are to fit.

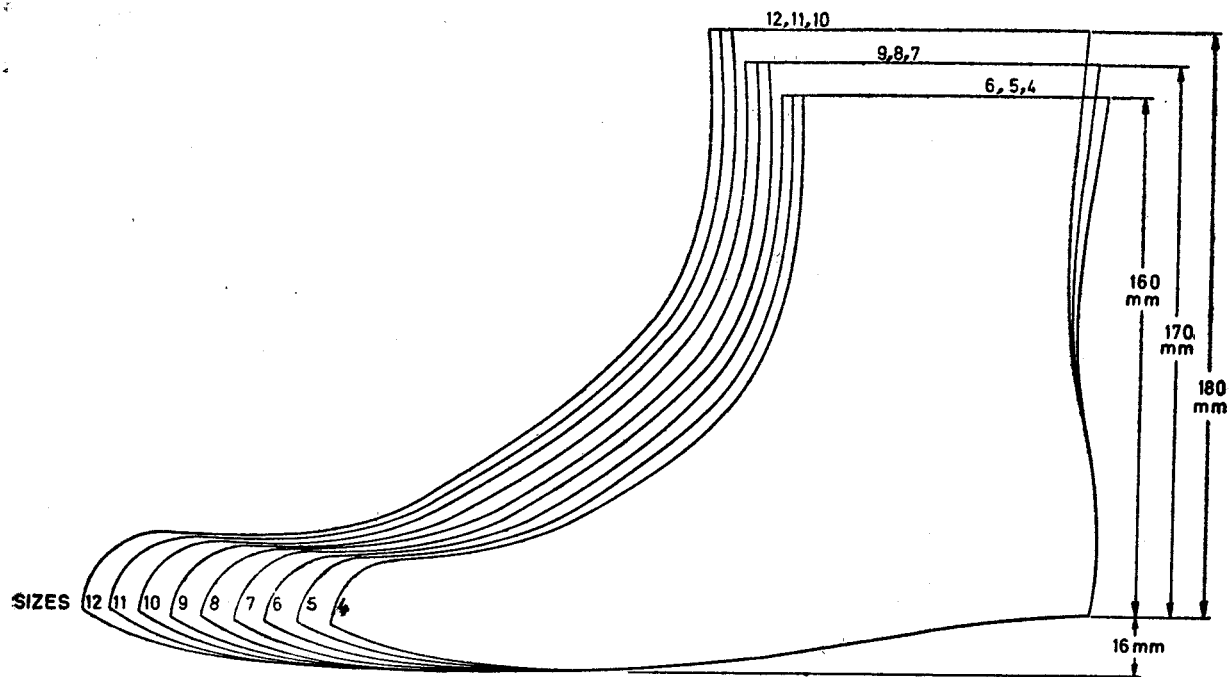


FIG. 7 GRADED PROFILE PATTERNS

7.2.3.7 Measure the height of the quarter pin mark with measuring tape or gauge.

7.2.3.8 *Measurement of heel height* — Place the last on a level surface. Raise the seat of the last until the tread line touches the level surface. Then measure the height of the seat from the level surface, which gives the heel height, taking care that the seat of the last is almost parallel to the ground.

7.2.4 Examine the location of the joint measurements as given in Appendix A.

NOTE 1 — An approximate location of the ball and instep girth measurements in insole pattern is shown in Fig. 4. It requires little skill and can be performed very easily without the help of any apparatus and may be considered as standard practice under the existing conditions.

NOTE 2 — Although the joint girth measurement is taken diagonally, makers of the lasts take this measurement at arbitrary points enabling them to place the measuring tape flat on the surface of the last, which takes in either the inside joint or the outside joint, but never both.

7.2.5 Following the system given in 7.2 to 7.2.4, check the correctness of the position of pin-points, the bottom of the last and the insole checked by marked lines such that starting from the toe part it coincides all over with the bottom of the last.

7.2.5.1 The pin-points at the joints (inside and outside) shall be located exactly at the ends of the lines above the counter (feather edge) of the last at a distance of 10 mm.

7.2.5.2 The correctness of the position of the pin-points at the base of the instep (along the centre line of the last) shall be checked either by the measuring tape with the help of the pin-points of the joints for measurement of the ball girth or with the longitudinal front profile with which the mark point is put on the last and the coincidence of the pin-point on the last with the points of the profile is observed.

7.2.6 For determining the correctness of the position of the pin-points for measurement of the instep girth of the cone of the last the followings are recommended.

7.2.6.1 This point shall be marked along the middle of the cone at a distance of 60 mm from the ball joint pin-point which is located at the base of the instep cone (see Fig. 4).

7.2.6.2 While measuring the instep girth, lay the tape on the last in such a way that its measuring edge lies flat and fits closely on the last touching the selected point.

NOTE — Like the joint measurement the instep measurement also may not be located exactly by rule. Half-standard length of the last (excluding the difference between the length of the insole and foot), on an imaginary line through the length may be given as the approximate position. The largest girth at that point probably answers the purpose best.

7.2.7 Check-Up of the Insole Pattern — In order to check the basic dimensions of the insole, it is necessary to determine the position of the points of measurement.

7.2.7.1 Determine the position of the points of measurement by means of a special pattern or template, the constructional details of which are given in Fig. 5 and Appendix A.

7.2.7.2 Test carefully beforehand the graded patterns of insole and profile templates of longitudinal and transverse section used for check-up of the lasts.

NOTE — The actual or stick-length of a last may vary from the standard length of the insole pattern as it frequently does. The insole length shall be always 2 to 3 mm shorter than the stick-length by virtue of the back curve protruding behind it. The accepted stick-length of a last is the distance from the centre of the curve at the back to the extreme top of the toe. The actual size-stick length is not to be used to denote the foot-fitting length of a last. For any given shoe or last size, the foot shall be shorter than the insole by at least 10 mm when measurement is taken in a sitting position.

7.3 Mechanical Characteristics

7.3.1 Test the following characteristics after cutting or opening up the lasts drawn for the purpose:

- a) Wall thickness of the lasts,
- b) Physical properties of the metal used,
- c) Dimensions of the pins, and
- d) Proper fitting of the pins.

7.3.2 Examine whether the pins are vertical to the surface of the heel.

7.3.3 Examine whether the hole for the holder is vertical to the surface of the heel and the distance for the centre of the pin hole as shown in Fig. 2.

APPENDIX A

(*Clauses 3.4, 7.2.4 and 7.2.7.1*)

DETAILS OF INSOLE CONSTRUCTION

A-1. The details of the points, lines, dimensions and angles relating to the construction of insole, shown in Fig. 5, are as follows:

AB — Absolute insole length

AD — Foot sole length

BD — Absolute addition

C — Point of intersection of the joint measuring line and the middle line. ($AC = \frac{2}{3} AB$. Draw transverse line EF through C making an angle of 90° with AB . EF = width of ball or tread width. $FF_1 = 2$ cm). Angle $EFF_1 = 90^\circ$. (Take the ball measurement with tape along line EF_1)

J — Point for the heel measuring line. ($AJ = \frac{1}{6} AD$. LK = width of heel and depends on fitting)

M — (Draw a straight line through J from A at a distance of 15 mm from C on the ball line EF . This is the axis of symmetry for heel end)

CEG — Big toe angle. (Draw from E a straight line in the toe direction making an angle of 80° with EF . This line intersects the transverse line through D at G)

CFH — Small toe angle. (Draw from F a straight line in the toe direction making an angle of 80° with EF . This line intersects the transverse line through D at H)

Z — Small toe point. (This point is marked on FH such that $FZ = \frac{1}{10} AD$)

D — Toe height (with bottom iron plated last)

S — Height of the heel

T — Toe spring

APPENDIX B

(Clause 6.1)

SCALE OF SAMPLING AND CRITERIA FOR CONFORMITY

B-1. SCALE OF SAMPLING

B-1.1 Lot — All the last pairs in a consignment of the same style, type, size and fitting and belonging to the same batch of manufacture shall be grouped together to constitute a lot.

B-1.2 For ascertaining the conformity of the lasts to the requirements of this specification, tests shall be carried out for each lot separately. The number of last pairs to be drawn from any lot shall depend on the size of the lot and shall be in accordance with col 1 and 2 of Table 2.

B-1.3 Last pairs shall be selected at random from the lot and in order to ensure randomness of selection, a random number table (see IS: 4905-1968*) shall be used. In case such a table is not available, the following procedure shall be adopted:

Arrange all the pairs in the lot in a systematic manner and starting from any pair count them as 1, 2, 3,..... up to r and so on in one order, where r is the integral part of N/n (N being the total number of pairs in the lot and n the number of pairs to be selected in the sample). Every r th pair thus counted shall be withdrawn to give sample for test.

TABLE 2 SCALE OF SAMPLING

(Clause B-1.2)

NUMBER OF LAST PAIRS IN THE LOT	FOR VISUAL CHARACTERISTICS		FOR DIMENSIONAL CHARACTERISTICS		FOR MECHANICAL CHARACTERISTICS, NUMBER OF SAMPLE PAIRS
	Number of Sample Pairs	Permissible Number of Defective Pairs	Number of Sample Pairs	Permissible Number of Defective Pairs	
(1)	(2)	(3)	(4)	(5)	(6)
Up to 20	All	0	5*	0	†
21 to 50	20	1	8	0	1
51 „ 100	32	1	13	0	2
101 „ 300	50	3	20	1	3
301 „ 1 000	80	5	32	1	5
1 001 „ 3 000	125	7	50	2	6
3 001 and above	200	10	80	3	8

*All if the number in the lot is less than 5.

†As agreed to between the purchaser and the supplier.

B-2. TESTS AND CRITERIA FOR CONFORMITY

B-2.1 Defective Pair — A pair in which a last has one or more defects with respect to a quality characteristic under consideration shall be considered a defective pair.

B-2.2 Tests

B-2.2.1 Visual Characteristics — All the pairs selected in accordance with B-1.2 shall be examined for visual characteristics (see 7.1). If the number of pairs failing to satisfy the requirements for these characteristics does not exceed the corresponding permissible number given in col 3 of Table 2, the lot shall be declared to be satisfactory in respect of these characteristics.

*Methods for random sampling.

B-2.2.2 *Dimensional Characteristics*

B-2.2.2.1 The lot which has been found satisfactory in respect of visual characteristics shall next be tested for dimensional characteristics (see 7.2 to 7.2.7.2).

B-2.2.2.2 The pairs for this purpose shall be drawn at random in accordance with col 4 of Table 2 from those selected for the purpose of **B-2.2.1**. If the number of pairs failing to satisfy the requirements for these characteristics does not exceed the corresponding permissible number given in col 5 of Table 2, the lot shall be declared to be satisfactory in respect of these characteristics.

B-2.2.3 *Mechanical Characteristics*

B-2.2.3.1 The lot which has been found satisfactory for visual and dimensional characteristics shall then be tested for mechanical characteristics (see 7.3.1 to 7.3.3).

B-2.2.3.2 For this purpose, the pairs shall be drawn at random in accordance with col 6 of Table 2 from those selected for the purpose of **B-2.2.2**. The lot shall be considered to be satisfactory in respect of these characteristics, if all the selected pairs satisfy the requirements for these characteristics.

B-2.2.4 The lot shall be declared as conforming to all the requirements of this specification if it passes as in **B-2.2.1**, **B-2.2.2** and **B-2.2.3**.

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AMENDMENT NO. 1 JULY 1982

TO

IS:7329-1974 SPECIFICATION FOR METAL LASTS FOR
SAFETY RUBBER-CANVAS ANKLE BOOTS

Alteration

[Page 12, Table 1, col(12), against Sl No.(i) to
(ix)] - Substitute the following for the existing
entries:

'(12)

325

335

345

355

365

375

385

395

405'

(CDC 40)



AMENDMENT NO. 2 AUGUST 1986

TO

IS:7329-1974 SPECIFICATION FOR METAL
LASTS FOR SAFETY RUBBER-CANVAS ANKLE BOOTS

(Page 8, clause 3.5.3) - Substitute the
following for the existing clause:

'3.5.3 *Wall Thickness* - The wall thickness of
different portions of the last shall be as follows
(see also Fig. 2 and 3):

<i>Portion</i>	<i>Wall Thickness</i> <i>mm</i>
Dorsal	4.00 Min
Planter	4.00 Min
Comb top:	
a) For pin attachment system	36.0±1.0
b) For other process	6.0±0.5

(CDC 40)

**AMENDMENT NO. 3 AUGUST 2004
TO
IS 7329 : 1974 SPECIFICATION FOR
METAL LASTS FOR SAFETY RUBBER-CANVAS
ANKLE BOOTS**

(*First cover and Title page*) — Delete the word 'SAFETY' in the title and wherever appears

(CHD 19)

Reprography Unit, BIS, New Delhi, India